B.Sc. Sem V

BOT-75T-301 (Plant Biochemistry and Physiology)

Short Answer Type Questions-

1. What is osmosis in the context of water absorption in plants?
2. Which part of the plant absorbs most of the water?
3. How do root hairs facilitate water absorption?
4. What role does soil texture play in water absorption by plants?
5. What is the difference between active and passive absorption of water?
6. What is the role of the endodermis in water absorption?
7. What is the main force responsible for the ascent of sap in plants?
8. What role do xylem vessels play in the ascent of sap?
9. How does capillarity contribute to the ascent of sap?
10. What is root pressure, and how does it affect the ascent of sap?
11. How does cohesion and adhesion of water molecules help in the ascent of sap?
12. What is transpiration pull, and how does it aid in the movement of water?
13. What is transpiration in plants?
14. How does transpiration help in cooling plants?
15. What are stomata, and how do they regulate transpiration?
16. How does the humidity of the surrounding air affect transpiration?
17. How does light affect the rate of transpiration?
18. What is guttation, and how is it different from transpiration?
19. What are macronutrients, and why are they essential for plants?
20. Name three primary macronutrients required by plants.
21. What role do micronutrients play in plant growth?
22. How does nitrogen deficiency affect plant growth?
23. Why is phosphorus important for plants?
24. What is the function of potassium in plants?
25. What are the consequences of calcium deficiency in plants?
26. How does magnesium contribute to photosynthesis?
27. Why is sulfur essential for protein synthesis in plants?
28. What is the process by which roots absorb mineral ions from the soil?
29. How does active transport differ from passive transport in mineral uptake?
30. What factors affect the uptake of minerals in plants?
31. How does the concentration gradient help in the uptake of minerals?
32. How does soil pH affect mineral uptake by plants?
33. What is the difference between symplastic and apoplastic pathways in mineral absorption?
34. What is phloem, and what role does it play in the transport of organic solutes?

35. What is translocation in plants?
36. What is the source-to-sink movement of organic solutes?
37. What is the role of companion cells in the transport of organic solutes?
38. How is sucrose transported from the leaves to other parts of the plant?
39. What factors influence the rate of translocation of organic solutes?
40. How do plasmodesmata help in the movement of organic solutes?
41. What is the primary function of photosynthesis in plants?
42. Where does photosynthesis occur in plant cells?
43. What is the role of chlorophyll in photosynthesis?
44. What are the products of photosynthesis?
45. What is the chemical equation for photosynthesis?
46. How does temperature affect the rate of photosynthesis?
47. What is photolysis in photosynthesis?
48. Why do plants appear green in color?
49. What is cellular respiration, and why is it important for plants?
50. Where does cellular respiration take place in plant cells?
51. What are the three main stages of aerobic respiration?
52. What is the difference between aerobic and anaerobic respiration?
53. What is the chemical equation for aerobic respiration in plants?
54. What are the byproducts of anaerobic respiration in plants?
55. How does temperature influence the rate of respiration in plants?
56. What is the role of NADH and FADH2 in cellular respiration?
57. What is nitrogen metabolism in plants?
58. In which form do plants absorb nitrogen from the soil?
59. What is nitrogen fixation?
60. What is the role of nitrate reductase in nitrogen metabolism?
61. How is ammonium assimilated in plants?
62. Why is nitrogen essential for plant growth?
63. What is the role of amino acids in nitrogen metabolism?
64. How does nitrogen deficiency affect plants?
65. What are root nodules?
66. Which plants commonly form root nodules?
67. Name the bacterium involved in nodule formation.
68. What is the role of *Rhizobium* in nitrogen fixation?
69. What is leghemoglobin, and why is it important?
70. Where does nitrogen fixation occur inside the nodule?
71. What are infection threads?
72. How do root nodules benefit the host plant?
73. What factors influence nodule formation?
74. What are lipids?

75. Name two major types of lipids found in cells.
76. What are fatty acids?
77. What is the difference between saturated and unsaturated fats?
78. Why are lipids insoluble in water?
79. What is the role of phospholipids in cell membranes?
80. What are triglycerides?
81. What is the function of waxes in plants?
82. What are steroids? Give one example.
83. Why are lipids considered high-energy molecules?
84. What are proteins?
85. What are amino acids?
86. What type of bond links amino acids in proteins?
87. What is the primary structure of a protein?
88. Name any two functions of proteins in living organisms.
89. What are enzymes?
90. How does temperature affect protein structure?
91. What is denaturation of proteins?
92. What is the difference between fibrous and globular proteins?
93. What is the role of proteins in cell growth and repair?
94. What are secondary metabolites?
95. How do secondary metabolites differ from primary metabolites?
96. Name any two classes of secondary metabolites.
97. What is the role of alkaloids in plants?
98. Give one example of a terpenoid.
99. Why are secondary metabolites important for plant defense?
100. What are phenolic compounds?
101. How do secondary metabolites benefit humans?
102. Name one secondary metabolite used as a drug.
103. In which plant parts are secondary metabolites commonly found?
104. What is a covalent bond?
105. What type of bond links amino acids in proteins?
106. Name the bond between monosaccharides in carbohydrates.
107. What is a hydrogen bond?
108. How do disulfide bonds stabilize protein structure?
109. What is an ionic bond?
110. Which bond holds fatty acids to glycerol in lipids?
111. What role do hydrogen bonds play in DNA structure?
112. What is a peptide bond?
113. Why are weak bonds important in biological systems?
114. What are enzymes?

115. What is the active site of an enzyme?
116. How do enzymes speed up biochemical reactions?
117. What is enzyme specificity?
118. What is the lock-and-key model of enzyme action?
119. What is the induced-fit model?
120. How does temperature affect enzyme activity?
121. What is the effect of pH on enzyme activity?
122. What are cofactors and coenzymes?
123. What is enzyme denaturation?
124. What is plant growth?
125. Name the three phases of growth in plants.
126. Which phase of growth is responsible for cell elongation?
127. What happens during the maturation phase?
128. In which region of the root does maximum growth occur?
129. What is the significance of the growth curve in plants?
130. What is differentiation in plants?
131. How does differentiation differ from growth?
132. What is dedifferentiation?
133. What is redifferentiation?
134. Give one example of differentiated plant tissue.
135. Why is differentiation important in plant development?
136. Can differentiated cells divide? Explain briefly.
137. What are plant growth hormones?
138. Name any two natural plant hormones.
139. What is the role of auxins in plant growth?
140. Which hormone promotes cell elongation?
141. Which hormone delays senescence?
142. What is the function of gibberellins?
143. Which hormone is responsible for fruit ripening?
144. What are growth inhibitors?
145. Name one synthetic plant growth regulator.
146. How do cytokinins affect cell division?
147. What is seed dormancy?
148. Why do seeds undergo dormancy?
149. Name one internal cause of seed dormancy.
150. What is scarification?
151. What is stratification?
152. How does light affect seed dormancy?
153. What role does abscisic acid play in seed dormancy?
154. How is seed dormancy beneficial to plants?

155. Name one method to break seed dormancy.
156. What is photoperiodism?
157. Who discovered photoperiodism in plants?
158. What is meant by critical photoperiod?
159. Name the three types of plants based on photoperiodism.
160. What are short-day plants?
161. What are long-day plants?
162. What are day-neutral plants?
163. Which plant part perceives photoperiodic stimulus?
164. What is the role of phytochrome in photoperiodism?
165. How does night length influence flowering?
166. What is vernalisation?
167. Why is vernalisation important in some plants?
168. Which plant part is sensitive to vernalisation?
169. What temperature range is effective for vernalisation?
170. Name one plant that requires vernalisation.
171. How does vernalisation promote flowering?
172. What is de-vernalisation?
173. Can vernalisation be reversed? How?
174. Which hormone is believed to be involved in vernalisation?
175. What is the agricultural significance of vernalisation?
176. What is florigen?
177. Who proposed the florigen concept?
178. Where is florigen synthesized in plants?
179. What is the chemical nature of florigen?
180. How does florigen induce flowering?
181. Name the gene associated with florigen.
182. How does the florigen concept explain grafting experiments?

Long Answer Type Questions-

1. Describe the mechanism of absorption of water by plants. Explain the role of root hairs and osmosis.
2. Explain the different pathways of water movement in roots with suitable diagrams.
3. Discuss active and passive absorption of water in plants.
4. Explain the factors affecting absorption of water by plants.
5. Describe the mechanism of ascent of sap in flowering plants. Explain the cohesion–tension theory.
6. Explain the role of transpiration pull in the ascent of sap.
7. Discuss various theories proposed to explain the ascent of sap. Which theory is most accepted and why?

8. Explain the structure of xylem and its role in the ascent of sap.
9. Define transpiration and describe its types.
10. Explain the mechanism of stomatal transpiration.
11. Discuss the factors affecting the rate of transpiration.
12. Describe the significance of transpiration in plants.
13. Describe the process of photosynthesis with a suitable diagram.
14. Explain the light reaction of photosynthesis.
15. Describe the dark reaction (Calvin cycle) of photosynthesis.
16. Describe the process of photorespiration involved in the C3 plants.
17. Discuss the factors affecting the rate of photosynthesis.
18. Explain the significance of photosynthesis in living organisms.
19. Explain the process of aerobic respiration in plants.
20. Describe the different stages of cellular respiration.
21. Compare aerobic and anaerobic respiration.
22. Explain the significance of respiration in plants.
23. Describe the role of essential mineral elements in plant nutrition.
24. Explain the criteria for essentiality of mineral elements.
25. Describe the deficiency symptoms of major mineral nutrients.
26. Discuss the role of macro- and micronutrients in plant growth.
27. Explain the mechanism of mineral uptake by plants.
28. Describe active and passive absorption of mineral ions.
29. Explain the role of mycorrhiza in mineral nutrition.
30. Discuss the factors affecting mineral absorption in plants.
31. Describe the structure of phloem and its role in translocation of organic solutes.
32. Explain the pressure flow hypothesis for translocation of food.
33. Discuss source–sink relationship in plants.
34. Describe the factors affecting translocation of organic solutes.
35. Describe nitrogen metabolism in plants.
36. Explain the process of nitrate assimilation in plants.
37. Discuss the importance of nitrogen in plant metabolism.
38. Describe the process of root nodule formation in leguminous plants.
39. Explain symbiotic nitrogen fixation with reference to *Rhizobium*.
40. Describe the structure of a root nodule.
41. Discuss the role of leghemoglobin in nitrogen fixation.
42. Describe the classification of lipids and explain their biological functions.
43. Explain the structure and functions of phospholipids in cell membranes.
44. Discuss the importance of lipids as energy reserves and structural components.
45. Describe the structure of proteins at different levels of organization.
46. Explain the classification of proteins based on structure and function.
47. Discuss the role of proteins in metabolism and cellular activities.

48. What are Carbohydrates? Write a detailed note on its classification, structure and importance.
49. Define secondary metabolites and explain their classification with examples.
50. Describe the biological significance of secondary metabolites in plants.
51. Discuss the role of secondary metabolites in plant defense and human welfare.
52. Explain different types of bonds present in biomolecules and their significance.
53. Describe the role of hydrogen bonds and disulfide bonds in protein structure.
54. Explain the importance of weak bonds in maintaining biomolecular structure.
55. Define enzymes and explain their properties.
56. Describe the mechanism of enzyme action.
57. Explain the factors affecting enzyme activity.
58. Discuss enzyme specificity and regulation.
59. Describe the different phases of growth in plants with the help of a growth curve.
60. Explain the grand period of growth and its significance.
61. Explain differentiation, dedifferentiation, and redifferentiation in plants.
62. Describe the role of differentiation in plant development.
63. Describe different classes of plant growth hormones and their physiological effects.
64. Explain the role of auxins, gibberellins, cytokinins, ethylene, and abscisic acid.
65. Discuss the agricultural applications of plant growth regulators.
66. Define seed dormancy and explain its causes.
67. Describe different methods of breaking seed dormancy.
68. Discuss the significance of seed dormancy in plants.
69. Explain photoperiodism and its significance in flowering.
70. Describe different types of plants based on photoperiodic response.
71. Explain the role of phytochrome in photoperiodism.
72. Define vernalisation and explain its mechanism.
73. Discuss the importance of vernalisation in agriculture.
74. Explain de-vernalisation and its significance.
75. Explain the florigen concept of flowering.
76. Describe the experimental evidence supporting the florigen concept.
77. Discuss the role of florigen in flowering and plant development.
78. Write brief note on the following: a) ABA, b) Ethylene, c) Apical dominance
79. Write short note on: a) Mechanism of action of auxin b) Effects and role of cytokinins
80. Write short note on: a) Photophosphorylation b) Photosynthetic pigments